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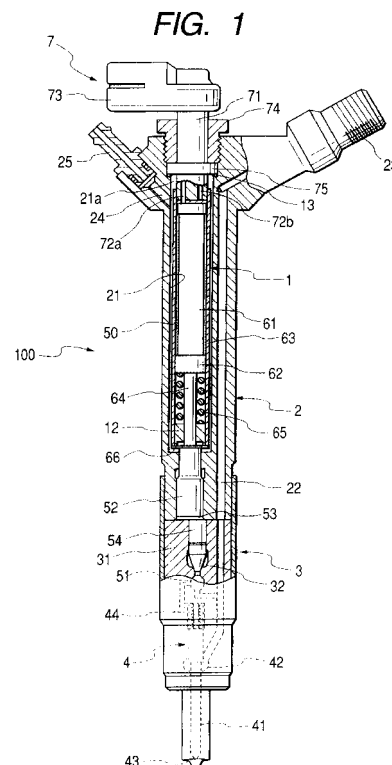
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(54) **Improved structure of fuel injector using piezoelectric actuator**

(57) A fuel injector for an internal combustion engine is provided. The fuel injector has a simple structure that is easy to install and remove a piezoelectric valve actuator in and from the fuel injector and to adjust fuel injection characteristics finely and that allows an overall size of the fuel injector to be decreased. The fuel injector includes a housing to be installed in the engine and a structural element serving to install the piezoelectric valve actuator in the housing to be detachable easily. The piezoelectric valve actuator is retained in an actuator casing fitted in the housing so that it can expand or contract to move a needle valve. The actuator casing has an extensible portion in itself or is coupled to a bellows in alignment for enabling the piezoelectric valve actuator to expand, thereby allowing the size of the actuator casing to be minimized.





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EUROPEAN SEARCH REPORT

Application Number
EP 01 11 5292

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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		10 February 2003	Sideris, M
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04001)



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Application Number

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 11 5292

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The present search report has been drawn up for all claims		
Place of search	Date of completion of the search	Examiner
THE HAGUE	10 February 2003	Sideris, M
CATEGORY OF CITED DOCUMENTS		
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document

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**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
EP 01 11 5292

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 15-29

Construction of a piezoelectric actuator for a fuel injector

2. Claims: 1-14

Fixation of piezoelectric actuator in the housing of a fuel injector in a detachable way

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 01 11 5292

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office (EPO) file on the European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82